характеристик нанотрубок. Одна из задач в данном направлении – поиск способов активации поверхности ГНТ посредством химического или физического воздействия, такого как, например, ионизирующего излучения (ИИ).

Целью данного исследования являлось изучение характеристик радиационно-индуцированных сигналов ЭПР в галлуазите различного происхождения (необработанный природный галлуазит из разных месторождений и аттестованные эталонные образцы ГНТ), возникающих в результате воздействия ИИ различной мощности и в широком дозовом диапазоне.

Показано, что при воздействии ИИ в галлуазите возникают долгоживущие радиационно-индуцированные парамагнитные центры (РИЦ). Наблюдается некоторые отличия параметров возникающих парамагнитных центров от происхождения материала, эти отличия могут быть связаны с разной степенью чистоты исходных образцов. Интенсивность сигналов ЭПР РИЦ меняется в зависимости от дозы ИИ и структуры образца.

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PHOTOLUMINESCENCE OF OXYGEN-DEFICIENT CENTRES IN RE-IMPLANTED SILICA GLASS

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The ion implantation is an effective method for modification of optical and electronic properties of functional materials. The goal of the work was to study the optically active defects arising during the implantation process ion of quartz glass KUVI (type IV) and after the subsequent thermal annealing of the samples.

The metal-vapor vacuum arc ion source was employed for rhenium ion-beam obtaining. Re-cathode was manufactured from rhenium powder of 99.9 wt % purity by pulsed magnetic pressing. The 80 keV Re-ions were separated for implanting from the overall beam and pulsed-repetitive ion-beam current density has been strictly limited at 0.75 mA/cm^2. We connected one kind of Re-ion bar treatment modes for our KUVI-SiO_2 glass – sample 5 *10^{16} cm^{-2} before and after annealing [1][2].

The photoluminescence (PL) characteristics under excitation 6.97 eV and 7.75 before and after annealing in the UV energy region from 2.5 to 5 eV were measured at room temperature. The experimental spectra of photoluminescence were normalized to an equal number of incident photons.

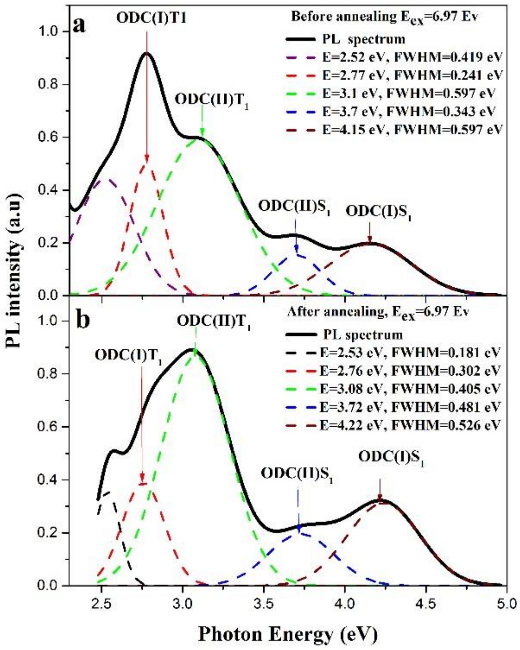

Fig. 1 - PL spectra for SiO_2:Re glass (E_{exc} = 6.97 eV) before (a) and after (b) annealing (at 1000 ºC, t = 1 h, T = 300 K) at concentration 5*10^{16} ion/cm^2 after deconvolution into Gaussians.

The photoluminescence spectrum (Fig. 1) exhibits an intense band with a maximum at 2.77 eV before annealing and a weaker band with a maximum at 3.1, 3.7 and 4.15 eV. Fig. 1a. but after annealing the photoluminescence spectrum (Fig. 1b) exhibits an intense band with a maximum at 3.08 eV and a weaker band with a maximum at 2.76, 3.72 and 4.2 eV [3].

The observation of these bands in the photoluminescence and photoluminescence excitation spectra of this sample suggests the formation of oxygen-deficient centers [4] at luminescence bands at 3.7 and 4.15 eV before annealing and 3.72 and 4.2 eV after annealing, which were related to the singlet–singlet luminescence ($S_0 \rightarrow$ S1) of different kinds of ODC’s.

Radiative transitions from excited triplet states ($T_1 \rightarrow S_0$) of ODC’s showed up as luminescence bands at 2.77 and 3.1 eV before annealing and 2.76 and 3.08eV after annealing. The shift of the maxima of the singlet and triplet PL bands in the spectra of SiO_2:Re relative to those of the analogous bands in pure glassy SiO_2 was explained by the modification of oxygen-deficient centers with Re ions. Also, the predominance of defects like ODC (II) over defects ODC (I) was seen after thermal treatment of SiO_2:Re. Consequently, the got outcomes point to the likelihood of an intentional difference in luminescent properties of SiO_2 glass doped by rhenium.

Thus, the results of the work indicate that during the implantation of silicon dioxide by Re ions, a special type of oxygen-deficient defects modified by rhenium occurs. Subsequent annealing of samples allows one to additionally change the properties of modified centers and to regulate their concentration. This approach allows you to manage the properties of materials and can be useful for change of specialized attributes of radiation detectors.

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INVESTIGATION OF PIEZOELECTIC AND ELASTIC PROPERTIES OF DIPHENYLALANINE MICROTUBES AFTER LYOPHILIC DRYING

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Self-assembled microtubes of diphenylalanine ($C_{18}H_{20}N_2O_3$, FF) are promising materials for biocompatible elements of new medical equipment [1], due to its outstanding piezoelectric properties [2, 3] comparable to those observed in lithium niobate [4]. This feature may be attributed to water molecules remaining inside the nanochannels after the self-assembly [5] and stabilizing its structure. However, the effect of water on the nanotubes' physical properties is still poorly understood.

Here we investigated the effect of water concentration on piezoelectric response and Young's moduli of FF microtubes. The microtubes were grown from FF powder (Bachem AG, Switzerland) dissolved in mixture of 1,1,1,3,3,3-Hexafluoro-2-propanol and water [2]. The water content in the microtubes was determined by previously described method [6] using confocal Raman microscope Alpha 300AR (WITec, Germany). The variation of water content was done by freeze dryer system Alpha 2-4 LSC (Martin Christ, Germany). The piezoelectric coefficient and local Young's moduli were measured using scanning probe microscope MFP-3D (Asylum, USA) and nano-hardness tester NanoScan-4D (FSBI TISNCM, Russia), respectively.